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STRIPLINE POCKEL'S CELL ASSEMBLY  
INSTRUCTIONS

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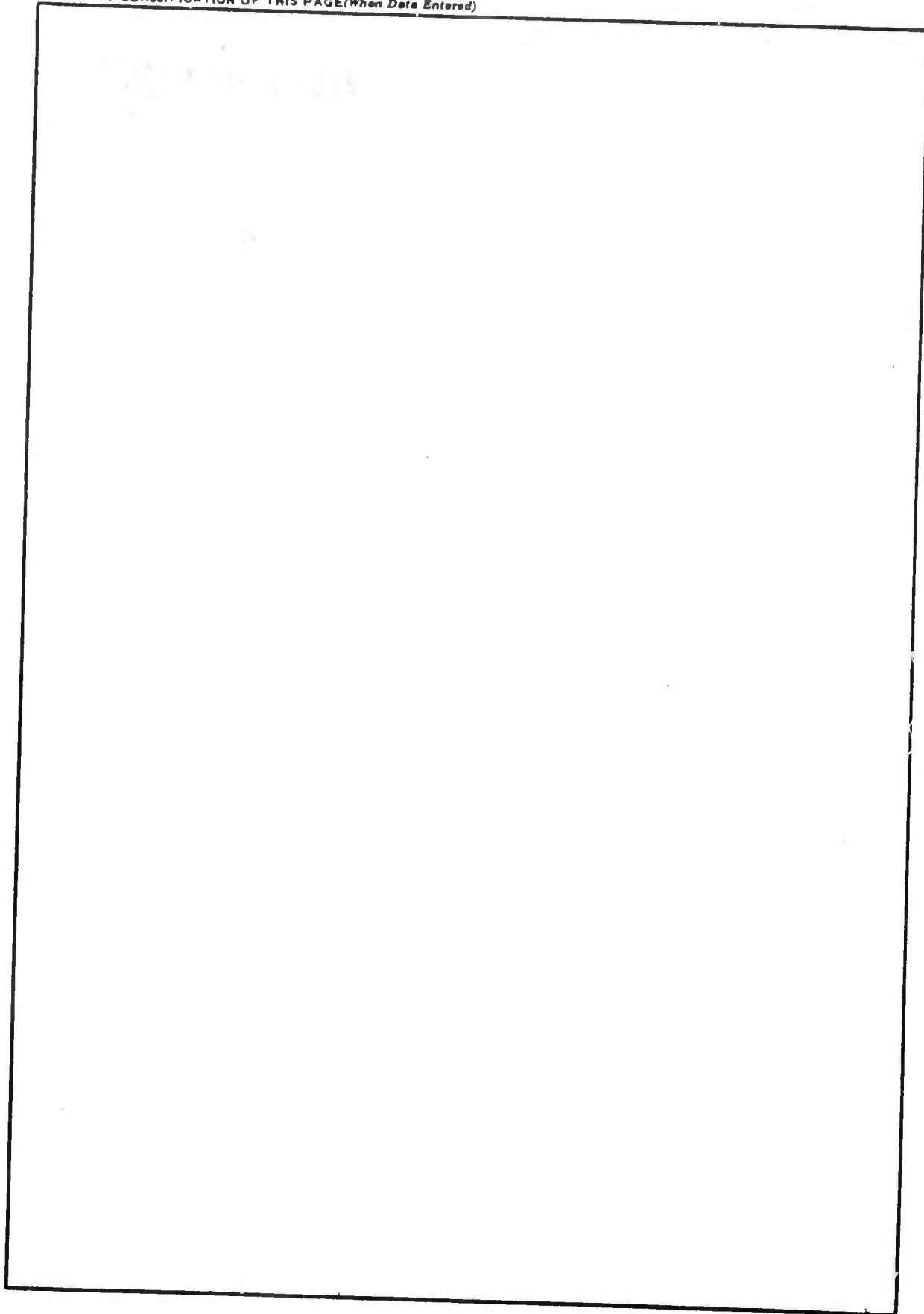
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#### ABSTRACT

This report contains a step-by-step assembly procedure for the Pockel's cells used in the NRL Glass Laser Facility. Also included are some repair notes.

## Stripline Pockel's Cell Assembly Instructions

### I. INTRODUCTION

This memo report is intended as an aid for assembly or repair of the stripline Pockel's cells used by the NRL Glass Laser Facility. The theory and calculations which led to these Pockel's cells are contained in NRL Report #7463. (1)

The following drawings are listed as aids in the construction procedure.

- (a) #65-161: Modified GR-874 Connector (Figure 3)
- (b) #65-126: Pockel's Cell Crystal
- (c) #65-175-1: 27 mm Pockel's cell detail (Figure 4)
- D65-175-2: Pockel's Cell Assembly
- (d) 65-178: 35 mm Pockel's Cell Detail

There are certain precautions which must be observed in the construction of Pockel's cells. Since KD\*P is a soft, hygroscopic, temperature sensitive crystal, it must be handled with extreme care. The crystals should not be subjected at any time to over 40% relative humidity, and should be stored below 20% relative humidity to prevent fogging. Alcohol, acetone, or other volatile solvents should never be used to clean KD\*P crystals, as the result will most likely be a shattered crystal. Plastic gloves should be worn when handling the crystal, but in no case should the optical surfaces be touched, even with plastic gloves. Also, do not use canned freon to attempt to blow dust off the crystal: the cold freon will shatter the crystal.

If it becomes necessary to clean the face of a crystal, or to dust it, rinse the crystal thoroughly with a 3-M "Fluorinat" Brand Electronic Liquid such as FC-77, then lay a piece of optical tissue on the optical surface and gently draw it off. This will remove the liquid before it evaporates and carry away any dust or dirt left on the crystal.

### II. CONNECTOR AND STRIP LINE ASSEMBLY

Drawing #65-161-1 is an illustrated breakdown and assembly drawing for the modified General Radio connector used with the Pockel's cells. Figure #1 shows the .003" copper strips used to assemble the

stripline. Parts #1 and #3 of this figure are ground lines; part #2 connects to the center conductor. Being careful not to distort the teflon insert with excessive heat, parts #1 and #3 (ground planes) should be soldered to the retaining ring (Part #0874-6420) so that their center lines are parallel to the center line of the connector and perpendicular to the mounting plane of the connector. Part 2 is then connected to the center conductor (C65-161-2) by a 3/16" long #2-56 screw. Using a 0.190" spacer, part #2 is oriented and bent so as to be parallel to part #1 and spaced .190" from it. Part 2 is soldered into this position. The result should be identical to Figure #2. (Use standard 60-40 electronic grade solder.)

The connector should now be thoroughly cleaned in an acetone bath ultrasonic cleaner. Next, coat the teflon insulator on the strip line side with Dow Corning #1203 primer and allow to dry. The cup formed by the "spacer" and insulator is then filled with Dow Corning 184 Sylgard (which has been vacuum outgassed) and baked in an 80°C oven for 2 hours.

### III. CONNECTOR AND STRIPLINE INSTALLATIONS

Drawing #D65-175, sheet 1, is the Pockel's cell assembly drawing. All the Delrin parts should be thoroughly (ultrasonically) cleaned before starting. Then the connector holes in part #1 and the faces of parts #3 and #4 which face the connector should be coated with Dow Corning 1203 primer and allowed to dry completely. After drying, install parts #3 and #4 in part #1. Then, center a 1" wide strip of .0035" Kapton Temp-R-Tape on the center conductor and stripline so that it is between the striplines. Place the connector loosely in part #1, guiding the two strip lines so that they stick out the sides of the crystal holder like rabbit ears. Start the bolts that hold the connector to part #1, then seal around connector hole and connector with Dow Corning 731 RTV. Now, tighten down the connector and wipe off the excessive RTV. Pull the two striplines down tight against part #3 (or #4) so they are bent at right angles, and tape their ends down with teflon Temp-R-Tape. There should now be a .190" gap between the strips out to where the crystal will be placed, with the kapton tape between the strips and out one face of the holder. There should also be room for the crystal in the holder. The part is now turned with the connector down, and the stripline channel is filled with vacuum outgassed Dow Corning 184 and baked in an 80°C oven for two hours.

The above procedure is now repeated for the other connector.

#### IV. ELECTRODE AND CRYSTAL INSTALLATION

Make a scale model of each size Pockel's cell crystal. Place the mock-up crystal in part #1 so that its center coincides with the center plane of the strip line. Trim the excess strip line with a pair of scissors leaving about 1/4" sticking out beyond the mock-up. Trim the Kapton tape so that it is even with the edge of the mock-up. Slide the electrodes (part #7) into place between the copper strips, then fold the copper strips over the electrode. Now place part #6, the window holders, into place on each side to make sure the mock-up crystal is centered properly, then remove them.

Make certain the ledges on the edge of the electrode have been tinned. Holding the mock-up in place (clamp it), place the ground side electrode (no kapton tape on the strip line) in place. The long channel on the electrode should face away from the crystal, and the edge of the electrode aperture which has been filed should be up (towards part #2). Trim the stripline with a razor blade so that it just fits the ledge, and solder it to the electrode. With the 1st electrode soldered in place, locate the second electrode correctly and trim its stripline to fit also. Remove the 2nd electrode, bend the stripline flat so the mock-up crystal is easily inserted and removed, and remove the mock-up crystal. Finally, clean all parts again thoroughly.

With all parts dry, clean, and at the same temperature, gently place the real crystal in place. Be careful not to touch the optical surfaces or chip the optical face where it is inserted into the electrodes. Gently slide the two side crystals into place, and put the 2nd electrode properly in place. The stripline is now bent over the electrode and epoxied to it using TRA-CON #BA-2902 Silver Conductive Epoxy. Only a very small amount is required. Remove the excess epoxy, being very careful not to get any on the optical face of the crystal. Put the unit in the dessicated cabinet and allow to dry at least 48 hours before using.

#### V. WINDOW INSTALLATIONS AND FINAL ASSEMBLY

Referring again to drawing #D65-175-1, the window holders are part #6. The o-ring to be used is listed with the drawing. The important thing is to have everything very clean. After cleaning windows, o-rings, and window holders, handle them only when wearing plastic gloves. Use optical cleaning paper to hold the windows when inserting them into the holder, as plastic gloves will smear windows also. After assembly, store in a clean dry place until ready to use.

For final assembly, observe all the usual precautions. Fix part #2 (top) to part #1 (crystal holder). Carefully place a very small amount of Dow Corning 731 RTV along the front cracks formed by the



mating of the top and holder. Allow to dry, then carefully flush the crystal and window holder with clean FC-48. Install the face o-rings and attach the window holders to the body. Fill and empty the completed cell with FC-48, and fill again.

As a final step, check the electrical continuity from center pin-to-center pin and shell-to-shell of the connectors for a short, and shell-to-center pin for an open. If this checks out, the Pockel's cell is ready for use.

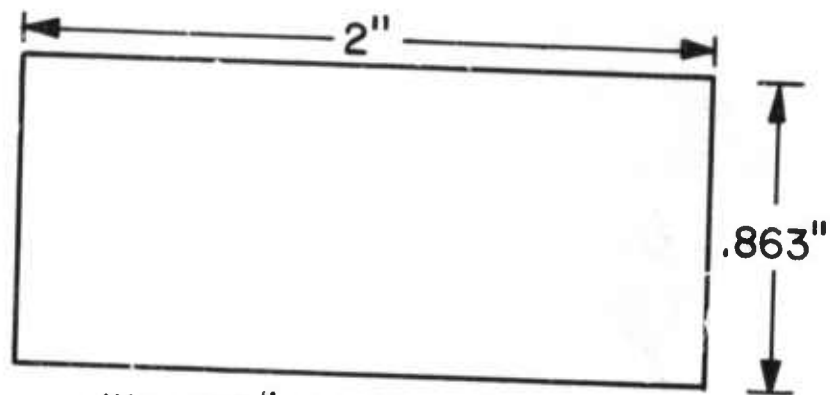
#### VI. REPAIR NOTES

If the Pockel's cell develops electrical problems, the most likely culprit is the silver-epoxy bond. Drain the cell completely, allow to drip dry in a dessicator, and check continuity again. If continuity returns, a silver-epoxy joint has separated and must be re-epoxied. Take the windows and top off, carefully remove and clean the epoxied electrode and reassemble starting from Section IV.

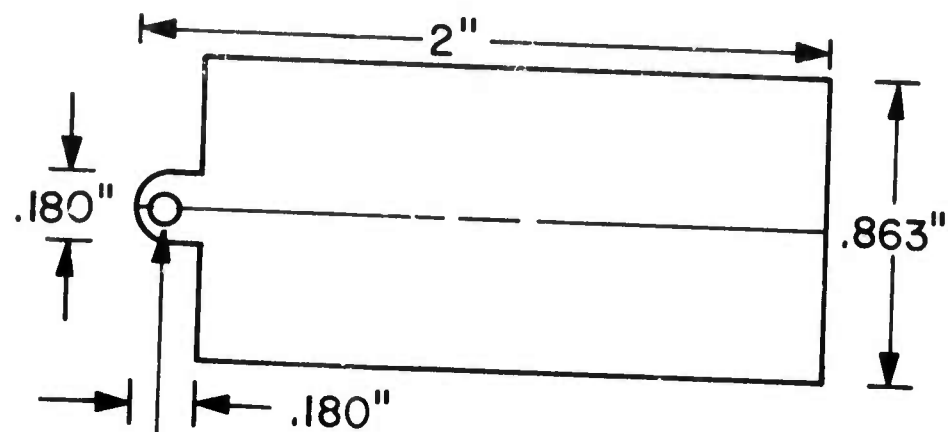
For crystal replacement, strip the cell as above (including epoxied electrode). Remove the crystals. The side pieces will be reused in the repaired cell. With the crystals removed, carefully clean out all the epoxy possible for the strip line and electrode (the epoxy is partially soluble in acetone) and assemble the cell again with the new crystal, starting from Section IV.

#### REFERENCE

1. "Parallel Plate Transmission Line Pockels Cell", by J. P. Letellier, NRL Report 7463, October 12, 1972.

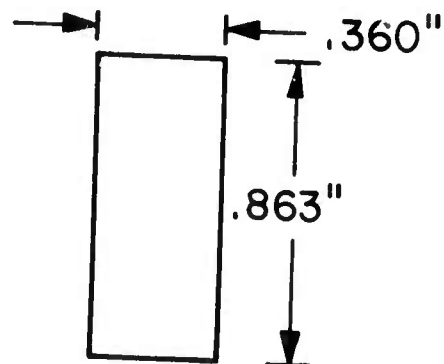


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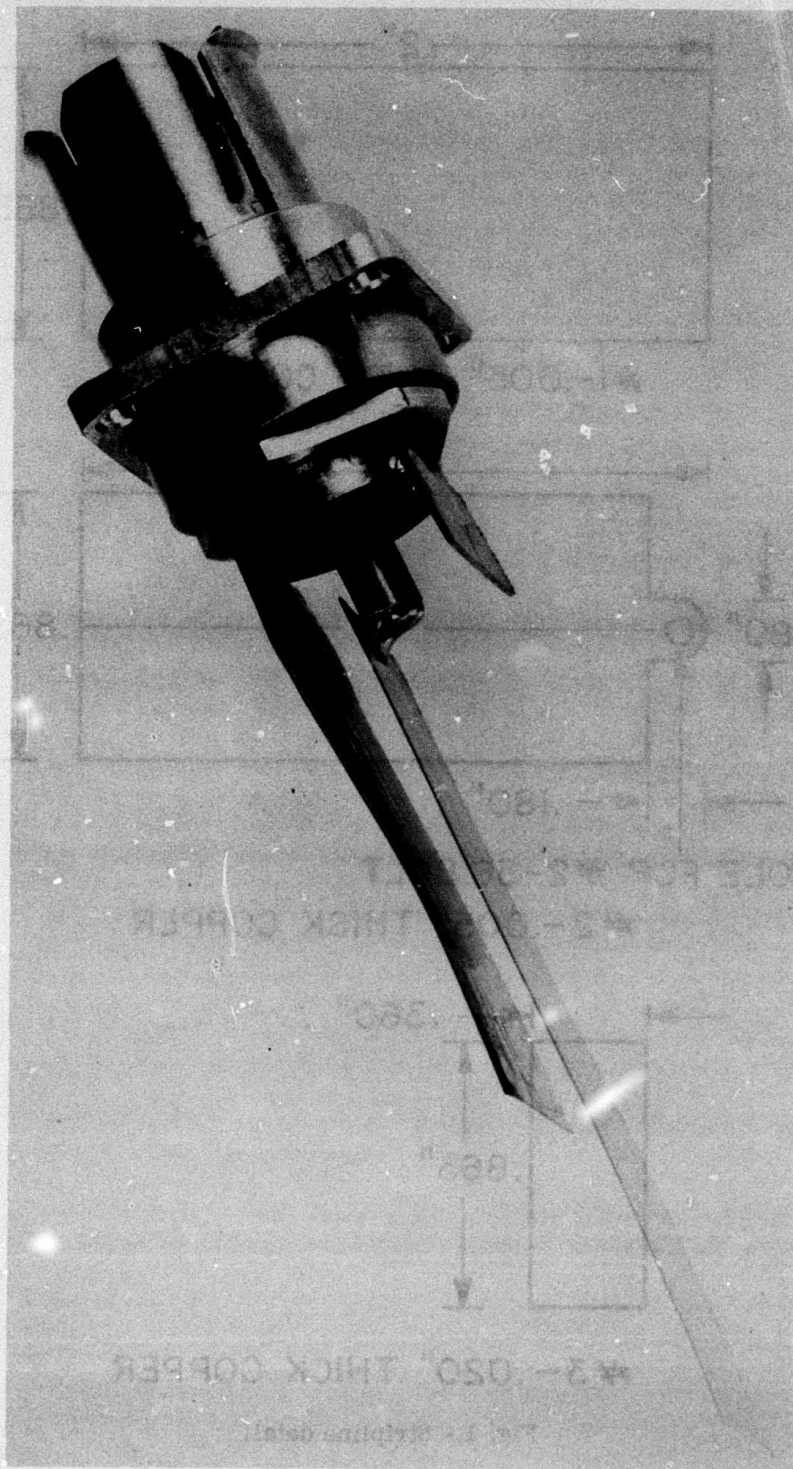
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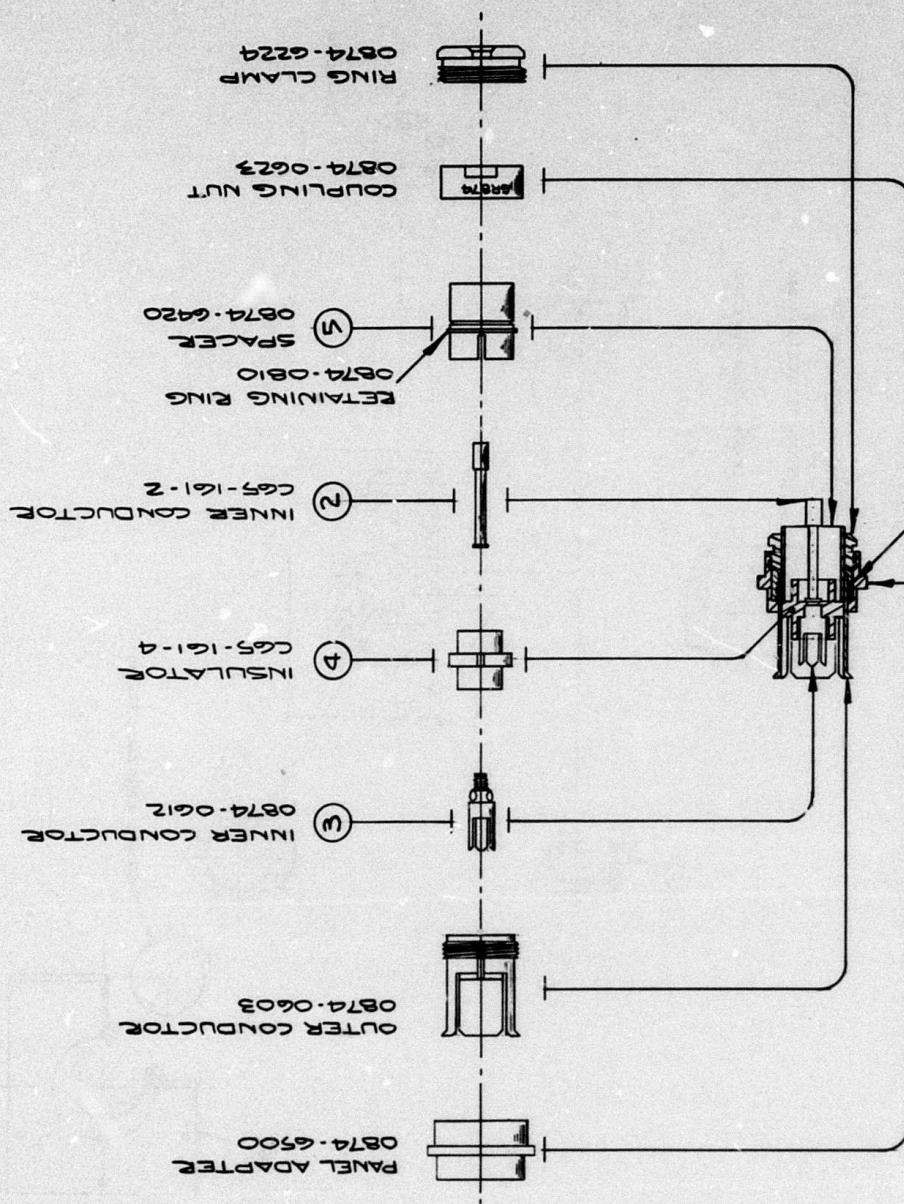


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Fig. 1 - Stripline detail



**Fig. 2 - Assembled connector**



1 SUB-ASSY  
Fig. 3 - Modified GR-874 connector



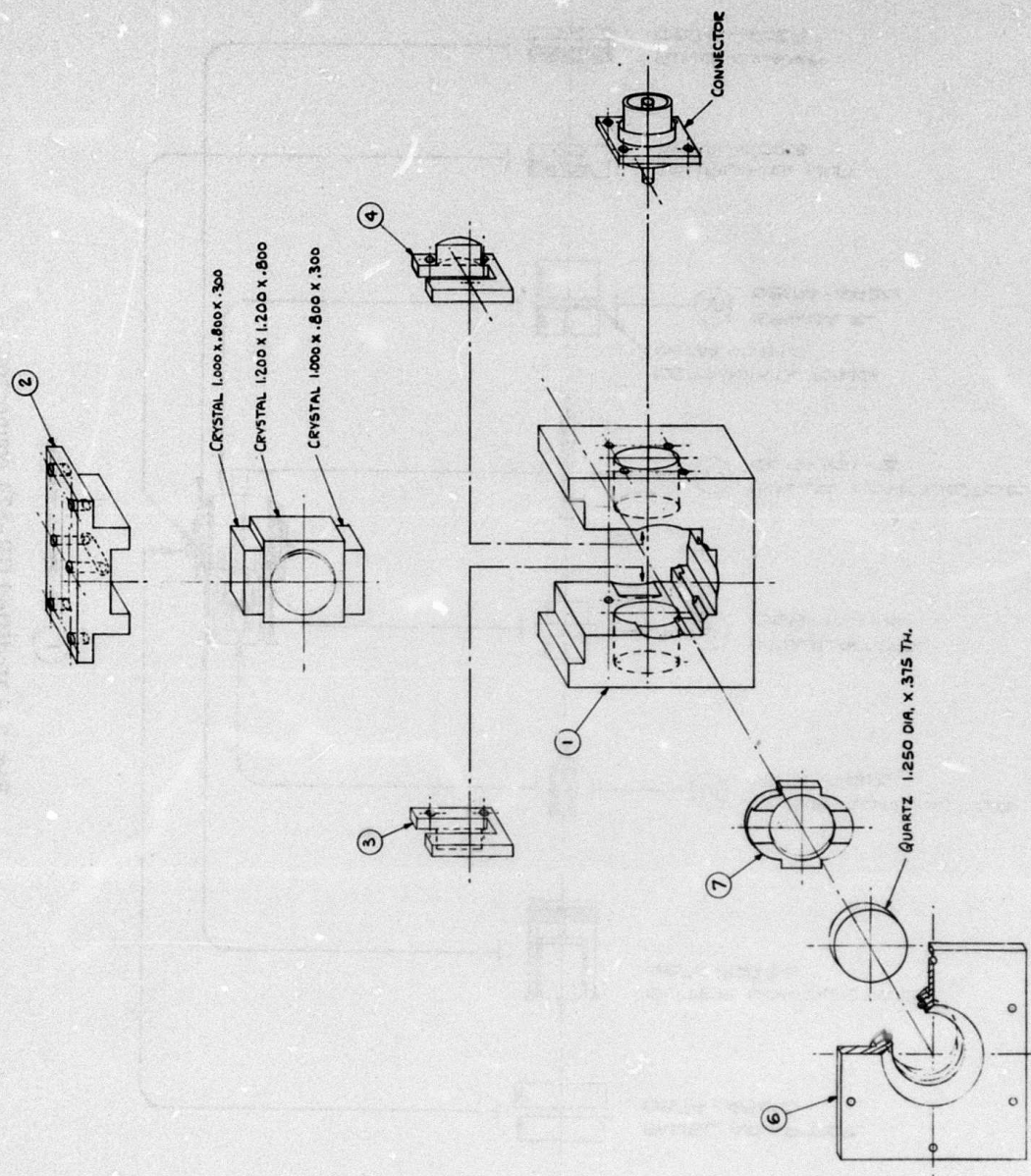


Fig. 4 - 27 mm Pockel's Cell detail